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PROBLEMS.

359. *By George Lilley, A. M., Corning, Iowa.*—Find the greatest and least number of balls of equal diameter (radius r) that can be put in a given box, a feet long, b feet wide and c feet high.

360. *By Tho's Spencer, Meriden, Conn.*—Prove, of all spherical triangles of equal area, that of the least perimeter is equilateral.

361. *By John H. Christie, State College, Pa.*—A right cone, radius of base R and altitude a , is pierced by a cylinder whose radius is r , the axis of the cylinder intersecting the axis of the cone at right angles and at a point whose distance from the vertex of the cone is b . Required the solidity common to the cone and cylinder.

362. *By E. B. Opdycke, Pulaski, Ohio.*—A section of an embankment is a feet long; the top width of both ends is b feet; the width of the ends at bottom is c and d feet, respectively, and the corresponding depths of the ends are e and g feet. Develop a Rule, and give the contents.

363. *By Prof. W. W. Johnson, U. S. Naval Acad., Annap., Md.*—The tangent at one end of a chord of an ellipse is parallel to the line joining the other end with a fixed point within the ellipse. Show that the area of the locus of the middle point of the chord is one half the area of the ellipse.

364. *By W. E. Heal, Marion, Ind.*—Discuss the curve whose equation is $x = \log [y + \sqrt{(y^2 - 1)}]$, and find its area and length.

365. *Selected, By Prof. H. T. Eddy, Cincinnati, Ohio.*—Show that

$$\int_0^{\frac{1}{2}\pi} \frac{\sqrt{1-c} \cdot d\theta}{1-c \cos^n \theta} = \frac{\pi}{\sqrt{2n}}$$

when c is indefinitely nearly equal to unity, n being a positive quantity.

366. *By R. S. Woodward, Detroit, Mich.*—What is the probable error in a system of errors (y) given by the equation

$$y = a_1 \cos(rz + \beta_1) + a_2 \cos(2rz + \beta_2) + \dots + a_n \cos(nrz + \beta_n), \text{ wherein } a_1, a_2, \text{ etc.}, \beta_1, \beta_2, \text{ etc., and } r \text{ are constants, and all values of } z \text{ are equally likely?}$$

367. *By Prof. Simon Newcomb, Wash., D. C.*—Prove the equation

$$\begin{aligned} \log \left(1 - \frac{2\gamma}{1+\gamma^2} \cos x \right) &= -\gamma^2 + \frac{1}{2}\gamma^4 - \frac{1}{3}\gamma^6 + \text{etc.} \\ &\quad - 2\gamma \cos x - \frac{1}{2} 2\gamma^2 \cos 2x - \frac{1}{3} 2\gamma^3 \cos 3x - \text{etc.} \\ &= \sum_{i=1}^{\infty} (-1)^i \frac{\gamma^{2i}}{i} - \sum_{i=1}^{\infty} \frac{2\gamma^i}{i} \cos ix. \end{aligned}$$